



EXPLORE SCIENCE

Implementation of the Dual Anonymous
Peer Review (DAPR) in NASA's
Science Mission Directorate.

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Overview

- Unconscious bias and the peer review process
- The origin and impacts of NASA's dual-anonymous peer review (DAPR)
- The Status of SMD's DAPR implementation
- General Overview of the DAPR Approach

Unconscious Bias and the Peer Review Process



Unconscious Bias and the Peer Review Process

- Unconscious biases (aka Cognitive Biases) are psychological “filters” that the human brain has developed to help us rapidly identify key information in the torrent of data our senses are constantly feeding to our brains.
- Unconscious biases are neither automatically good nor bad--everyone possesses unconscious biases of one sort or another. As a whole, they shape each person’s unique “worldview”.
- However, unconscious biases have a detrimental effect on the peer review process by making it less rational and more subjective. We would like the evaluation of proposals to be an objective process, independent of the worldview of each reviewer.
- Recommended viewing:
NASA Implicit Bias video <https://www.nasa.gov/offices/ocs/diversity-inclusion>

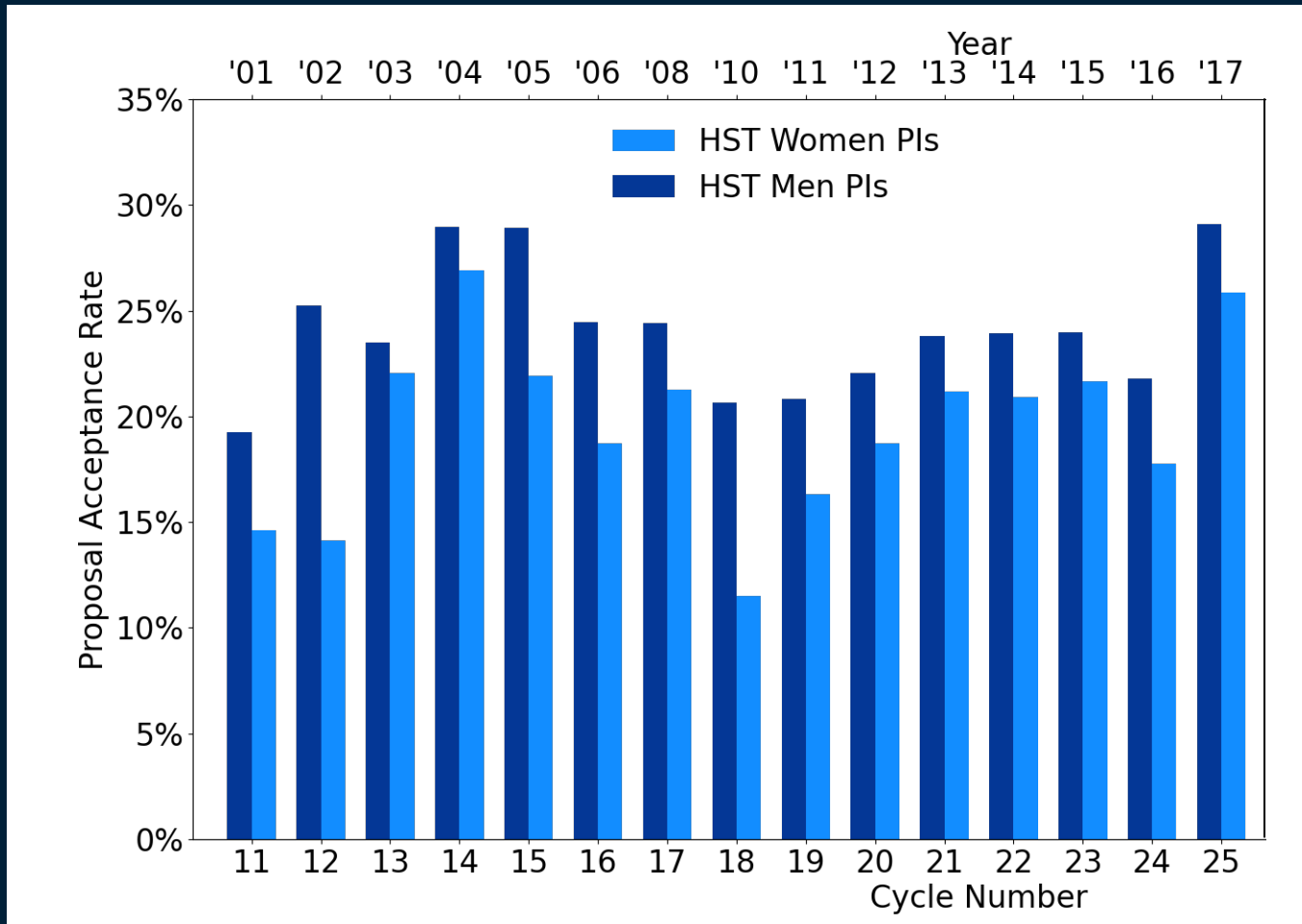
Unconscious Bias and the Peer Review Process

- In keeping with NASA's core value of Inclusion, SMD is strongly committed to ensuring that the review of proposals is performed in an equitable and fair manner that reduces the impacts of any unconscious biases.
- It is difficult to completely interrupt bias through training. Structural changes to the peer review process are needed.
- Since cognitive biases are manifested as short-cuts in the decision-making process, making that process as explicit as possible helps to mitigate them:
 - Apply clear requirements/criteria/factors (merit, relevance, cost);
 - Emphasize the use of those criteria in panel discussions;
 - Present clear reasoning tied to those criteria to support the findings captured in the written panel evaluation.
- This is exactly what the DAPR process is designed to facilitate.



The Origin and Impacts of NASA's DAPR Approach

Origin of NASA's DAPR process: The Hubble General Observer Program



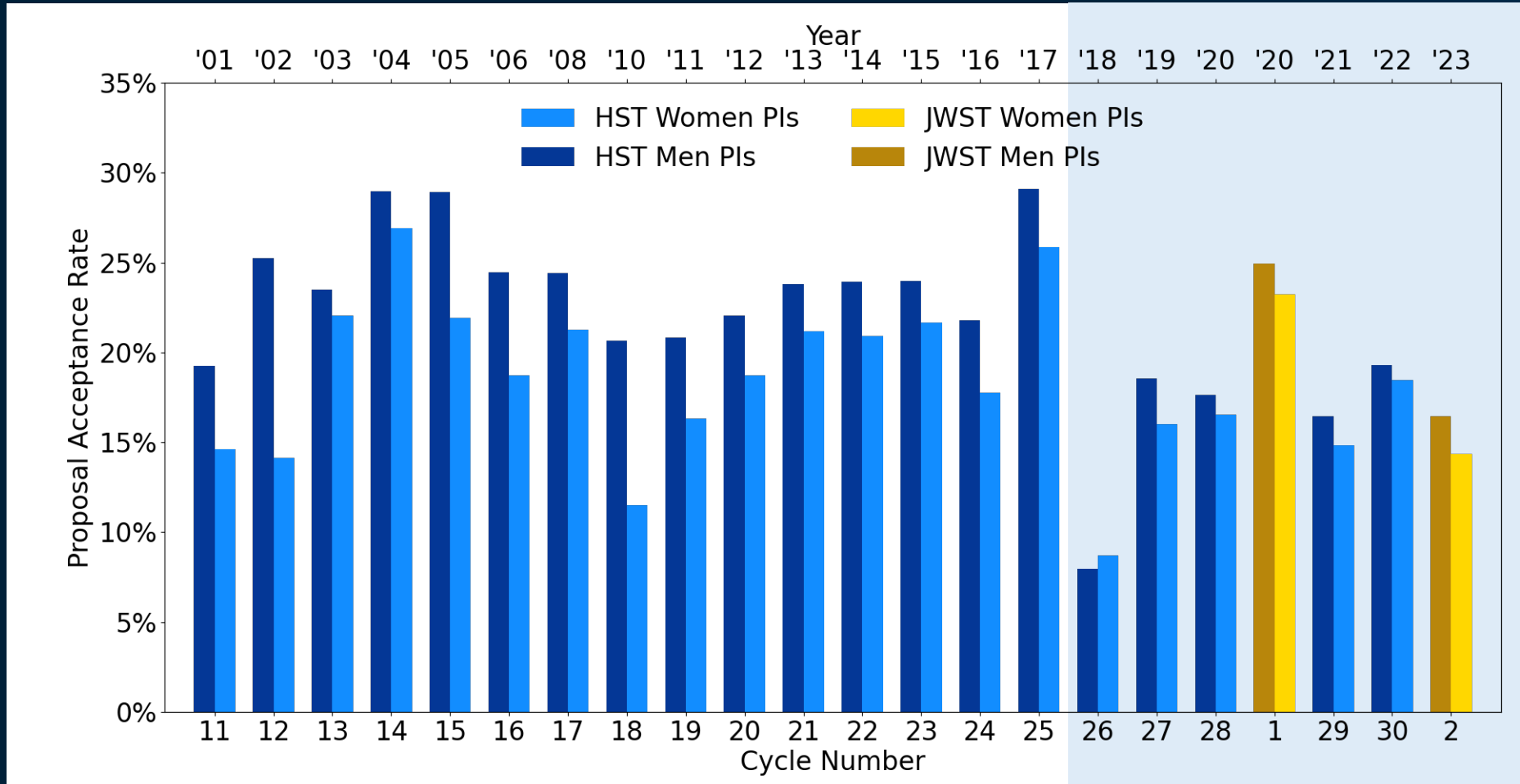
Analysis of ~15 years of data from the Hubble GO program showed that the success rate of male-led Hubble GO proposals was consistently higher than that of female-led proposals by an average of $4.5\% \pm 2.6\%$ (1σ).

To address this discrepancy, the Hubble GO team developed a model for conducting a dual-anonymous peer review and implemented it starting in 2018 (Cycle 26).

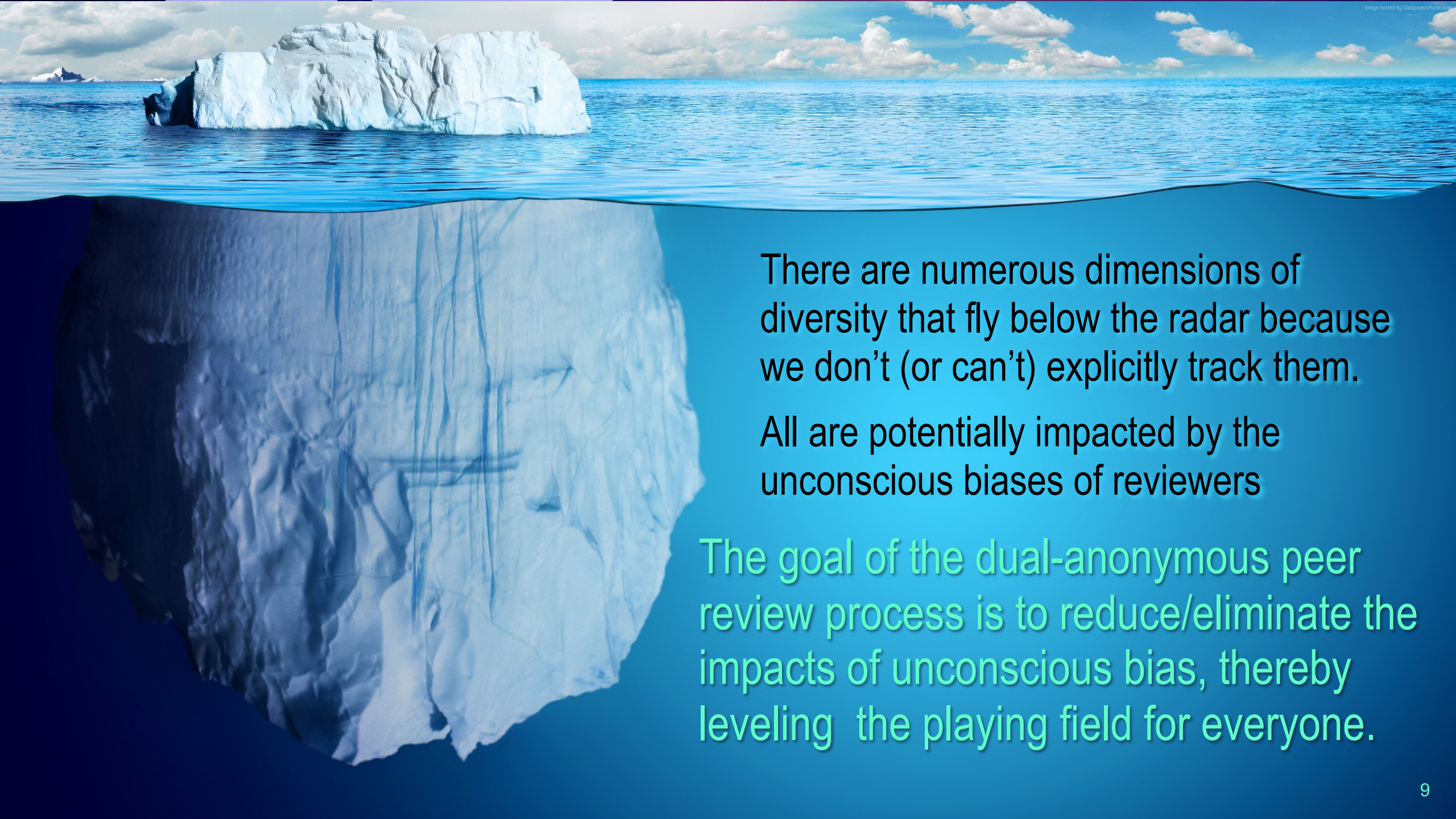
Origin of NASA's DAPR process: The Hubble General Observer Program

and JWST

After Introduction
of DAPR
→



In the 5 Hubble GO cycles since the adoption of the DAPR process and the first 2 JWST GO cycles, the disparity in the success rates of female-led and male-led proposals has been reduced by more than 70% to an average of $1.3\% \pm 0.6\%$ (1σ).

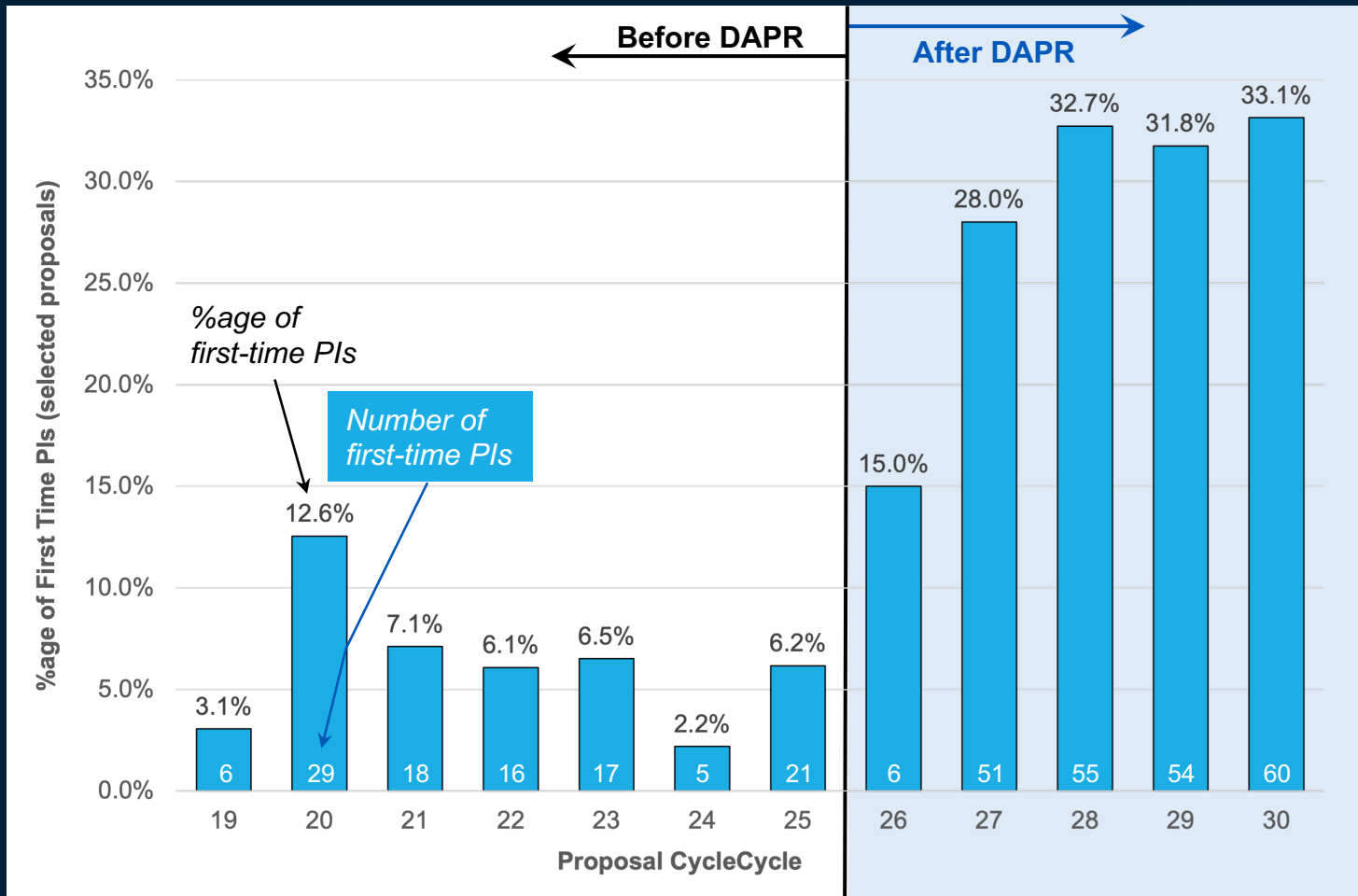


There are numerous dimensions of diversity that fly below the radar because we don't (or can't) explicitly track them.

All are potentially impacted by the unconscious biases of reviewers

The goal of the dual-anonymous peer review process is to reduce/eliminate the impacts of unconscious bias, thereby leveling the playing field for everyone.

Impact of DAPR Example 1: The Fraction of First-Time PIs in Hubble GO Selections



Since the adoption of the DAPR approach to their proposal review, the Hubble GO program has seen a sharp increase in the percentage of selected proposals that are led by first-time PIs.

Pre-DAPR Avg. = 6.3%

Post-DAPR Avg. = 28.1%

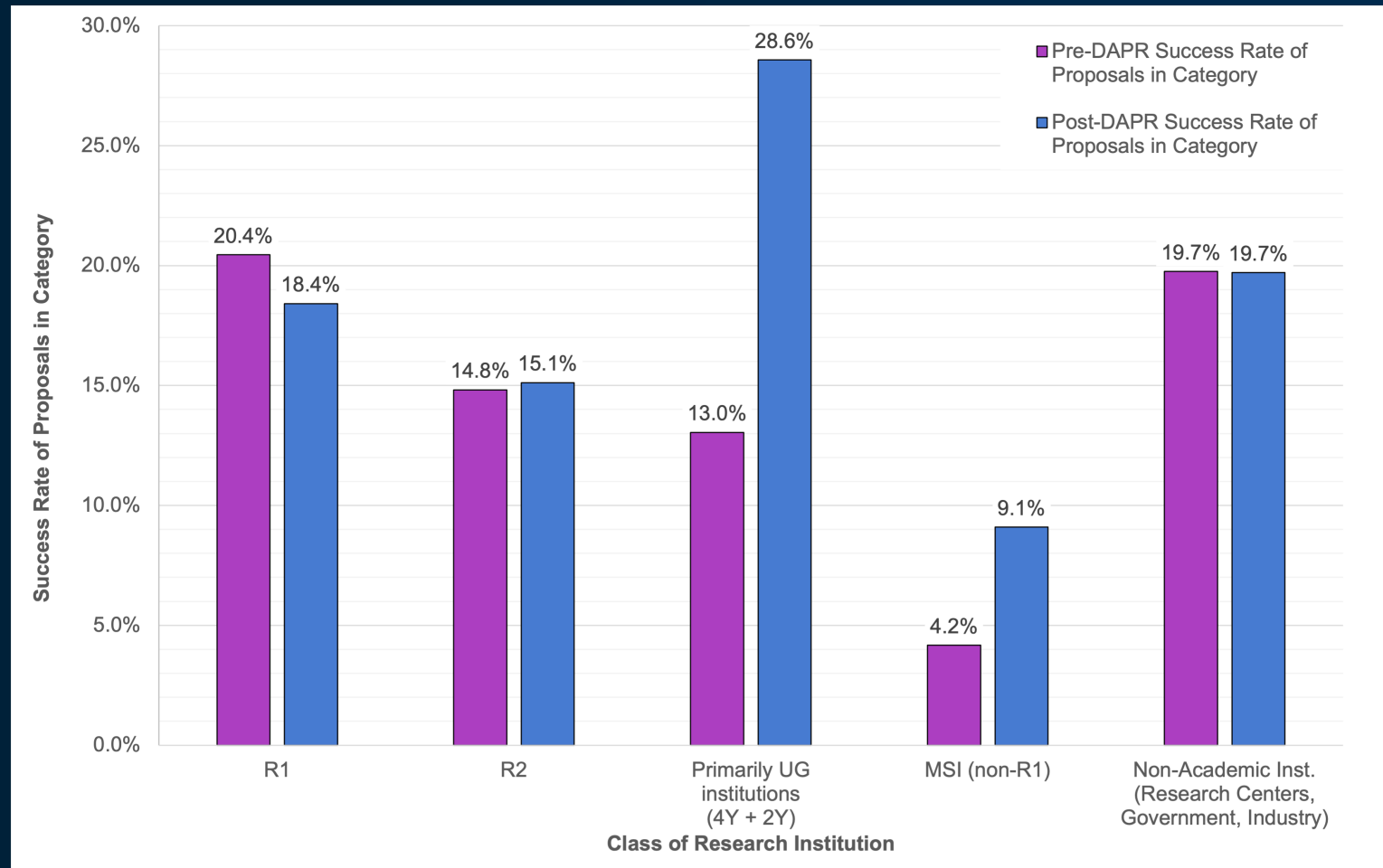
(C27-C30 Avg. = 31.4%)

Impact of DAPR Example 2: Institutional Success Rates for ADAP, ATP, and XRP

This plot shows a comparison of the success rates of proposals from different classes of research institutions before and after the implementation of the DAPR.

The data come from the Astrophysics Data Analysis, Astrophysics Theory, and Exoplanets Research Programs.

- ~4500 proposals pre-DAPR
 - ADAP, ATP – 9 cycles
 - XRP – 3 cycles
 - Avg. success rate: 19.7%
- ~1000 proposals post-DAPR
 - ADAP – 3 cycles
 - ATP – 1 cycle
 - XRP – 2 cycles
 - Avg. success rate: 18.4%



Data courtesy of Nino Cucchiara and Màire Volz

The Status of SMD's DAPR Implementation



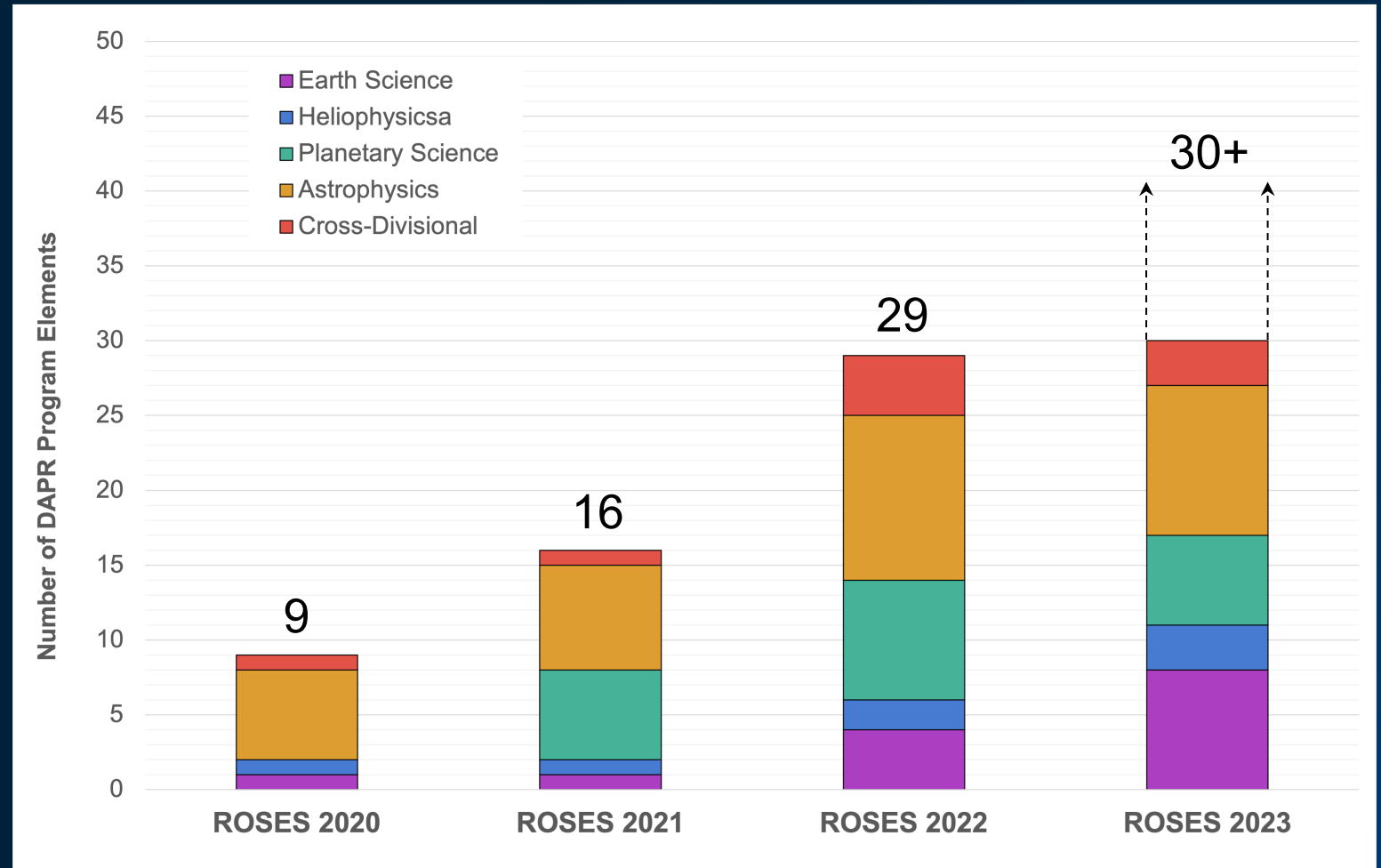
Expansion of DAPR, ROSES 2020 – ROSES 2023

DAPR introduced in SMD under ROSES 2020 with a pilot involving 4 ROSES Program Elements

- Astrophysics also converted all its mission Guest Observer/Guest Investigator (GO/GI) programs to DAPR (5 additional program elements)

Growth of DAPR has been steady

- 2020: ~10% of solicited programs
- 2021: ~20% of solicited programs
- 2022: ~30% of solicited programs
- 2023: ? (TBD)



Response to DAPR Is Overwhelmingly Positive

DAPR survey of reviewers conducted after the completion of DAPR panels has yielded 450+ responses spanning 14 different programs over 3 years in Astrophysics, Earth Science, Heliophysics, and Planetary Science.

The Dual-Anonymous Peer Review procedure improved the overall quality of the peer review.

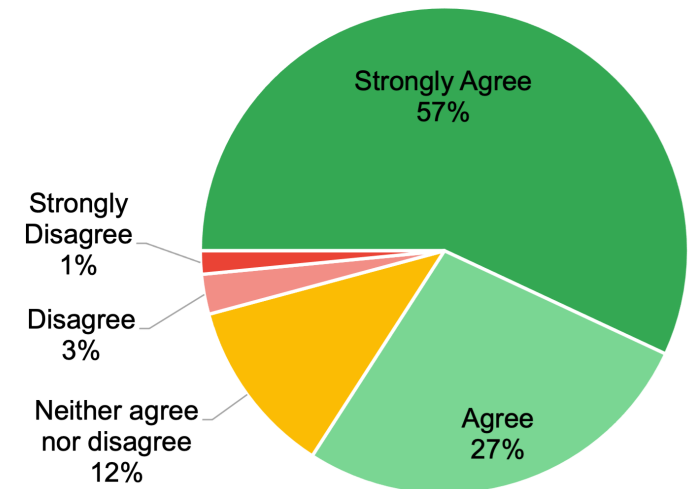
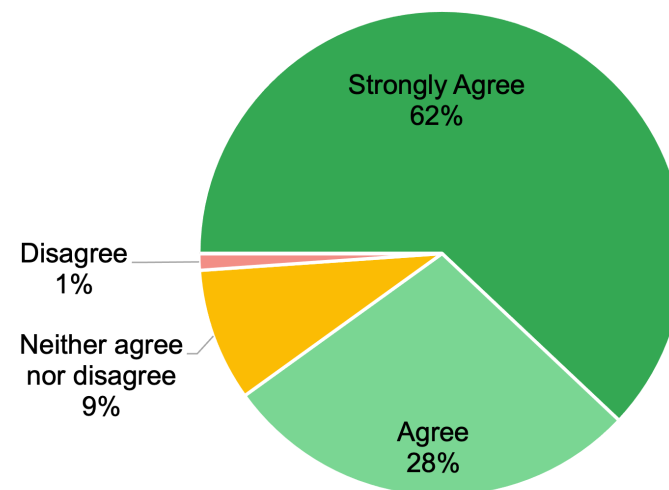
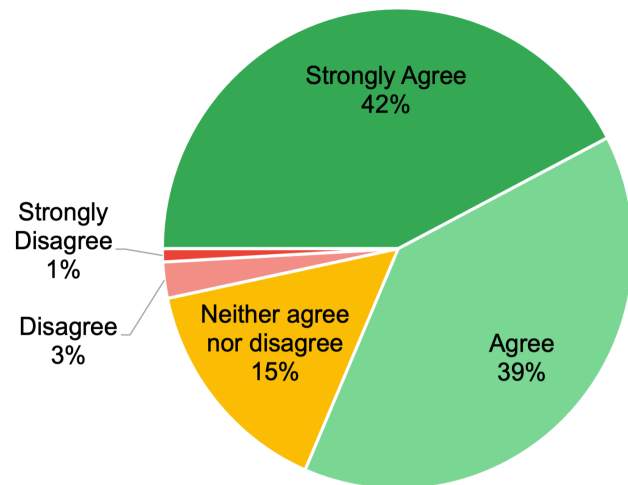
- 81% Agree or Strongly Agree

The Dual-Anonymous Peer Review procedure led to panel discussions being focused on the science rather than on the identities of the team members.

- 90% Agree or Strongly Agree

The Dual-Anonymous Peer Review process should be implemented in the future for the program I reviewed this year.

- 84% Agree or Strongly Agree



General Overview of the DAPR Approach



How Does DAPR Work?

Under DAPR, not only are proposers unaware of the identity of the reviewers, but the reviewers are not provided with explicit knowledge of the identities of the proposing team during the scientific evaluation stage.

Proposers are given instructions for preparing and submitting both: (1) an anonymized proposal document; and (2) a companion “Expertise and Resources Not Anonymized” (E&R) document.

Under DAPR, the review of proposals is split into two parts as follows:



Scientific/Technical Review. Reviewers have access only to the anonymized proposal documents while conducting the merit evaluation of each proposal. Proposals rated according to standard adjectival rating scale.

After the written evaluations and rating of all proposals is completed, the “E&R” documents are distributed for the highest rated proposals.



Validation of Qualifications. Based on the E&R package, panels validate the qualifications of the team and the availability of any supporting resources needed to execute the proposed investigation. Team E&R classified as Uniquely Qualified, Qualified, or Unqualified.

How Does DAPR Work?

The primary goal of dual-anonymous peer review is to eliminate “the team” as a topic during the scientific evaluation of a proposal, not to make it absolutely impossible to guess who might be on that team.

- Reviewers are repeatedly instructed NOT to engage in “detective” work;
- Reviewers are instructed to inform the Program Officer if they believe they know the identities behind a proposal;

By doing so, we shift the nature of the discussion away from one focused on the characteristics of people and institutions to one focused on the intrinsic scientific/technical merit, NASA relevance, and cost reasonableness of a proposal.

Oversight of panel discussions

- Each review panel is assigned a “Leveler” role is to ensure that the panel discussions focus on scientific merit.
- The leveler serves as a process monitor and facilitator; they do not participate in the scientific review of proposals
- If the discussion veers to discussion of topics related to the possible identities of the proposing team or institution and associated merits/shortcomings, the leveler’s job is to refocus the discussion or stop it altogether.

How Does DAPR Work?

The processes for managing conflicts-of-interest:

- Statutory conflicts-of-interest involving Civil Servants: Civil Servant reviewers must initially self-certify against lists of the proposers and the proposing organizations of all the proposals in their panel, albeit without attribution to specific proposals.
- Scientific Ethics conflicts-of-interest: Although the standard conflict-of-interest for reviewers from the same institution as the proposing organization do not automatically apply under DAPR, reviewers are not assigned formal review responsibility for any such proposals.
- In such a situation, reviewer who recognizes the institutional affiliation of the proposal on which they are conflicted can easily be recused.

The Path Forward

The **2022 NASA Equity Action Plan** identified the dual-anonymous peer review as an important component of its “*Equity in Grants and Cooperative Agreements*” Focus Area.

- “NASA plans to study lessons learned from the [prior DAPR] implementations and adopt the new process for all applicable Research Opportunities in Space and Earth Sciences (ROSES) by fiscal year 2024.” (p.9)
- SMD goal is to make DAPR the default review process beginning with ROSES 2025.

We will develop training materials for Program Officers and hold training sessions to facilitate the expansion.

Serve as a resource for other organizations within NASA as well as other institutions interested in adopting the DAPR process.

The 2022 NASA Equity Action Plan can be accessed online at:

https://www.nasa.gov/sites/default/files/atoms/files/nasa_-_equity_report_-_v8.pdf